Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-66 (Canceled)

67. (New) A virtual substrate comprising a non-silicon, optoelectronic semiconductor device film bonded to a semiconductor handle substrate where an interface between the device film and the handle substrate has low-resistance electrical properties.

68. (New) The virtual substrate of claim 67, wherein the interface has a resistance of 3.5 ohms cm^2 or less.

69. (New) The virtual substrate of claim 67, wherein the interface has a resistance of 35 ohms or less over a 0.1 cm^2 evaluation area.

70. (New) The virtual substrate of claim 67, wherein the bonded interface comprises covalent bonds between the device film and the handle substrate.

71. (New) The virtual substrate of claim 67, wherein the bonded interface exhibits ohmic characteristics.

72. (New) The virtual substrate of claim 67, wherein the bonded interface is of sufficiently low resistance to enable photovoltaic devices to be built on its surface in the device film.

73. (New) The virtual substrate of claim 67, wherein the device film is hydrophobically bonded to the handle substrate.

74. (New) The virtual substrate of claim 67, wherein the bonded interface does not contain an intervening oxide that significantly inhibits conductive properties of the interface.

75. (New) The virtual substrate of claim 67, wherein the optoelectronic device film is suitable for optoelectronic device fabrication in the film.

76. (New) The virtual substrate of claim 67, wherein the device film comprises a single crystal film.

77. (New) The virtual substrate of claim 67, wherein the device film comprises a Group III/V semiconductor material.

78. (New) The virtual substrate of claim 77, wherein the device film comprises InP.

79. (New) The virtual substrate of claim 77, wherein the device film comprises GaAs.

80. (New) The virtual substrate of claim 77, wherein the device film comprises GaN.

81. (New) The virtual substrate of claim 67, wherein the device film comprises a Group II/VI semiconductor material.

82. (New) The virtual substrate of claim 67, wherein the device film comprises a Group IV semiconductor material.

83. (New) The virtual substrate of claim 82, wherein the device film comprises Ge.

84. (New) The virtual substrate of claim 82, wherein the handle substrate comprises a silicon substrate.

85. (New) The virtual substrate of claim 82, wherein the handle substrate comprises a GaAs substrate.

86. (New) The virtual substrate of claim 67, wherein the device film comprises a Ge film and the handle substrate comprises a silicon substrate.

87. (New) The virtual substrate of claim 67, wherein the device film comprises an InP film and the handle substrate comprises a silicon substrate.

88. (New) The virtual substrate of claim 67, wherein the device film comprises a GaAs film and the handle substrate comprises a silicon substrate.

89. (New) The virtual substrate of claim 67, further comprising a strain compensation layer located on a back surface of the handle substrate.

90. (New) The virtual substrate of claim 89, wherein a coefficient of thermal expansion (CTE) difference between the strain compensation layer and the handle substrate is of a same sign as a CTE difference between the device film and the handle substrate.

91. (New) The virtual substrate of claim 90, wherein at least one strain compensation layer property is selected to control a bow of the virtual substrate over a given temperature range.

92. (New) The virtual substrate of claim 90, wherein the strain compensation layer is selected such that at a first temperature the strain energy in the strain compensation layer and the device film is matched.

93. (New) The virtual substrate of claim 89, wherein the strain compensation layer comprises a semiconductor layer deposited on the back surface of the handle substrate.

94. (New) The virtual substrate of claim 93, wherein the device film comprises germanium or a compound semiconductor material.

95. (New) The virtual substrate of claim 94, wherein the device film is selected from Ge, GaN, GaAs and InP films, the handle substrate comprises a silicon substrate and the strain compensation layer comprises a Ge layer.

96. (New) A method of forming a virtual substrate comprising: (1) treating a surface of at least one of a device substrate and a handle substrate to allow for a possibility of formation of covalent bonds between the device substrate and the handle substrate; (2) bonding the device substrate to the handle substrate to form a bonded interface comprising covalent bonds between the device substrate and the handle substrate; and (3) removing a portion of the device substrate so as to leave a device film on the handle substrate.

97. (New) The method of claim 96, further comprising ion implanting the device substrate prior to bonding to enable exfoliation of the device film from the device substrate by annealing the device substrate after the bonding step.

98. (New) The method of claim 97, wherein the step of removing comprises annealing the device substrate to exfoliate the device film from the device substrate.

99. (New) The method of claim 96, wherein the step of treating comprises at least of one of passivating and cleaning.

100. (New) The method of claim 96, wherein a bonded interface between the device film and handle substrates has low resistance electrical properties.

101. (New) The method of claim 96, wherein the interface between the device film and handle substrates has a resistivity of 3.5 ohms cm^2 or less.

102. (New) The method of claim 98, further comprising a performing a post bonding thermal anneal to strengthen the bond between the device film and handle substrate prior to performing the exfoliation anneal.

103. (New) The method of claim 97, wherein the step of ion implanting the device substrate comprises implanting H^+ or a combination of H^+ and He^+.

104. (New) The method of claim 99, wherein the steps of treating the surfaces of the device and handle substrates comprises passivating the surfaces of both the device and handle substrates to allow for hydrophobic wafer bonding.

105. (New) The method of claim 96, wherein the steps of treating the surfaces of the device and handle substrates comprises rendering the surfaces substantially hydrophobic prior to bonding.

106. (New) The method of claim 105, wherein the steps of treating comprises treating the handle and device substrate surfaces with HF solution.

107. (New) The method of claim 106, wherein the HF solution reduces or eliminates oxides on the handle and device substrate surfaces.

108. (New) The method of claim 96, wherein the step of treating comprises eliminating adsorbed water on the surface of at least one of the device substrate and the handle substrate by exposure of the surface to an inert atmosphere or vacuum prior to bonding.

109. (New) The method of claim 108, wherein eliminating adsorbed water comprises baking at a temperature such that a vapor pressure of water on at least one substrate surface is above a partial pressure of water in the surrounding environment.

110. (New) The method of claim 96, wherein the device film comprises a Ge, a Group II-VI, a Group III/V or a SiC semiconductor material and the handle substrate comprises a Si or a GaAs substrate.